

July 6, 1999

MEMORANDUM

SUBJECT: **Trichlorfon.** (Chemical ID No. 057901/List A Reregistration Case No. 0321). Acute and Chronic Dietary Exposure and Risk Analyses for the HED Human Health Risk Assessment. DP Barcode No. D257486.

FROM: Thurston Morton, Chemist
Reregistration Branch 4
Health Effects Division (7509C)

THRU: Sheila Piper, Chemist
William Cutchin, Chemist
Dietary Exposure Science Advisory Council

and

Susan V. Hummel, Branch Senior Scientist
Reregistration Branch 4
Health Effects Division (7509C)

TO: Carmelita White/ Betty Shackleford, PM #53
Reregistration Section
Special Review and Reregistration Division (7508W)

Action Requested

Provide a refined acute and chronic non-cancer dietary exposure and risk analysis for trichlorfon (057901) uses which are supported through reregistration. Tolerances of trichlorfon are currently expressed in terms of trichlorfon per se [40 CFR § 180.198]. Current tolerances with no U.S. registration on cattle, fat; cattle, mby; and cattle, meat are 0.1 ppm.

Executive Summary

- Acute and chronic non-cancer dietary exposure and risk estimates for trichlorfon are below HED's level of concern.
- Chronic non-cancer dietary exposure and risk estimates indicate the most highly exposed population subgroup is children 1-6 years, with 24 % of the chronic Population Adjusted Dose (% cPAD) consumed; the exposure estimate for the general US population corresponded to 12 % cPAD consumed.
- Acute dietary exposure resulted in risks below HED's level of concern. The most highly exposed subgroup was children 1-6 years, with 18 % acute PAD (aPAD) consumed at the 99.9th percentile of exposure; the exposure estimate for the general US population corresponded to 11 % aPAD consumed.

Toxicological Information

Memoranda providing details of relevant toxicological information include the HIARC report dated 6/2/99, a Cancer Peer Review report dated 10/22/97, and the FQPA Safety Factor Committee report dated 8/6/98.

The FQPA safety factor of 10X was retained for trichlorfon (see FQPA Safety Factor Recommendations for the Organophosphates, 8/6/98). A reference dose (RfD) which includes the FQPA safety factor (10X, 3X or 1X) is defined as the Population Adjusted Dose (PAD). Doses and endpoints for dietary risk assessment are presented in Table 1.

Table 1. Trichlorfon: Toxicological Doses and Endpoints for Dietary Risk Assessment.

EXPOSURE SCENARIO	NOAEL (mg/kg/day) Uncertainty Factors ¹	ENDPOINT (LOAEL, mg/kg/day)	STUDY	RfD/PAD ² (mg/kg/day)
Acute dietary	10 Conventional UF = 100X FQPA = 10X	Clinical signs, plasma, RBC and brain cholinesterase inhibition	Acute Neurotoxicity-Rat Study	aRfD = 0.1 aPAD = 0.01
Chronic dietary (non-cancer)	0.2 (LOAEL) Conventional UF = 100X FQPA = 10X	Brain cholinesterase inhibition in both sexes	Chronic Toxicity - Monkeys	cRfD = 0.002 cPAD = 0.0002
Cancer	N/A		Mouse Oncogenicity	

NOAEL = no observable adverse effects level; LOAEL = lowest observable adverse effects level; RBC = red blood cell.

¹ The conventional uncertainty factor of 100X includes 10X for interspecies extrapolation and 10X for intra-species variability.

² RfD = NOAEL/UF; PAD = RfD/FQPA SF.

Consumption Data

HED conducts dietary risk assessments using the Dietary Exposure Evaluation Model (DEEM™), which incorporates consumption data generated in USDA's Continuing Surveys of Food Intakes by Individuals

(CSFII), 1989-1992. For acute dietary risk assessments, the entire distribution of single day food consumption events is combined with either a single residue level (deterministic analysis, risk at 95th percentile of exposure reported) or a distribution of residues (probabilistic analysis, referred to as “Monte Carlo,” risk at 99.9th percentile of exposure reported) to obtain a distribution of exposure in mg/kg/day. For chronic dietary risk assessments, the three-day average of consumption for each sub-population is combined with residues in commodities to determine average exposure in mg/kg/day.

Residue Information

Tolerances of trichlorfon are currently expressed in terms of trichlorfon per se [40 CFR § 180.198]. Current tolerances with no U.S. registration on cattle, fat; cattle, mby; and cattle, meat are 0.1 ppm.

Refined residue estimates for acute and chronic dietary exposure analysis, generated in conjunction with the HED Chemistry RED (6/24/99) have been updated with the revised usage information and used for this dietary analysis. Supported food/feed uses of the insecticide trichlorfon are limited to dermal pour-on uses on cattle outside the United States. No other food/feed uses, foreign or domestic are to be supported through reregistration. The Biological and Economic Analysis Division (OPP/BEAD) has provided import information for beef/veal (email from A. Halvorson, 6/7/99) stating that 10.3% of the beef/veal consumption is from imports. HED is assuming 100 % of the imported beef would be treated which is a conservative estimate. The usage data are provided as Attachment 1; inclusion of the data in dietary exposure analyses is discussed below.

Table 2. Summary of Inputs to the Acute and Chronic DEEM™ Analysis.

Commodity	Reassessed Tolerance (ppm)	Est. Max. % Livestock Treated (Imported)	RDF for Probabilistic Analysis
Cattle, meat Veal, meat	0.2	10	Totalz=9 Totalnz=1 0.2
Cattle, fat Veal, fat	0.5	10	Totalz=9 Totalnz=1 0.5
Cattle, liver Veal, liver	0.1	10	Totalz=9 Totalnz=1 0.1
Cattle, kidney Veal, kidney	0.1	10	Totalz=9 Totalnz=1 0.1

Acute and Chronic Analysis, Summary of Residue Inputs

Acute and chronic non-cancer dietary exposure analyses were completed using the reassessed tolerances

and %beef/veal consumed which is imported. The inputs to the acute and chronic non-cancer analysis for trichlorfon are shown in Table 2. For the acute analysis, the adjustment for percent beef/veal imported was made in the RDF files. The DEEM™ default concentrations factors (adjustment factor 1) were used for dried meats; all other DEEM™ default concentration factors were 1X. Detailed residue inputs are shown in the attachments.

Results/Discussion

Estimated acute dietary exposure is below HED's level of concern. Use of reassessed tolerance-level residues in the assessment resulted in estimated dietary exposure corresponding to 11 %aPAD for the general US population, and 18 %aPAD for children 1-6 years old, the most highly exposed population subgroup.

Estimated chronic dietary exposure is below HED's level of concern. Use of reassessed tolerances results in a maximum risk of 24 % of the chronic PAD (%cPAD) for children 1-6. Dietary risk for the general US population was estimated to be 12 %cPAD.

Table 4. Acute and Chronic (Non-Cancer) Dietary Exposure/Risk.

Population Subgroup	Acute Reassessed Tolerances (Probabilistic) (99.9th %-ile)		Chronic Reassessed Tolerances	
	Exposure (mg/kg/day)	%aPAD	Exposure (mg/kg/day)	%cPAD
U.S. Population	0.001086	10.9	0.000025	12.3
All infants (<1 yr)	0.001354	13.5	0.000011	5.4
Nursing infants (<1 yr)	0.001228	12.3	0.000009	4.7
Non-nursing infants (<1 yr)	0.001452	14.5	0.000011	5.7
Children (1-6 yrs)	0.001761	17.6	0.000049	24.3
Children (7-12 yrs)	0.001249	12.5	0.000035	17.5
Females (13-19 yrs)	0.001004	10.0	0.000023	11.4
Females (13+ preg/not nursing)	0.000816	8.2	0.000019	9.6
Males (13-19 yrs)	0.000971	9.7	0.000030	15.2
Males (20+ yrs)	0.000840	8.4	0.000023	11.5

cc : Chem F, Chron F. Morton , L. Richardson

RDI:Dietary Exposure SAC; (S. Piper 6/28/99 & W. Cutchin 6/28/99); SVH:7/6/99

TM, Thurston Morton, Rm. 816D CM2, 305-6691, mail code 7509C

List of Attachments:

Attachment 1: Quantitative Usage Analysis, 5/99 (T. Kiely, BEAD/OPP).

Attachment 2: Residue Distribution Files for Probabilistic Analysis.

Attachment 3: Residue Information.

Attachment 4: Acute Analysis, Reassessed Tolerances.

Attachment 5: Chronic (Non-Cancer) Analysis, Reassessed Tolerances.

Attachment 1: Quantitative Usage Analysis (6/99 A. Halvorson)

BEAD has no usage data for beef in foreign countries.

However, Ag. Stats. 1998 provides the following information on imports:

U.S. consumption of beef/veal 1998 26,218 mill. lbs. (carcass wt. equiv.) Table 7-74

Imports of beef/veal into the U.S. 1998 2,700 mill. lbs. (carcass wt. equiv.) Table 7-70

% of U.S. beef/veal consump. that's imported (calculated) 10.3%

Major countries from which U.S. imports beef/veal (1996) from table 7-71, in descending order, are --

Canada

Australia

New Zealand

Minor countries from which U.S. imports beef/veal (1996) from table 7-71, in descending order, include --

Argentina

Uruguay

Brazil

Costa Rica

Nicaragua

Honduras

Mexico

Attachment 2: Residue Distribution Files for Probabilistic Analysis.

Documentation:doc beef fat trichlorfon

DOC ASSUMING 10% OF BEEF CONSUMED IN US IS IMPORTED

TOTALNZ=1

TOTALZ=9

0.5

Documentation:doc beef meat trichlorfon

DOC ASSUMING 10% OF BEEF CONSUMED IN US IS IMPORTED

TOTALNZ=1

TOTALZ=9

0.2

Documentation:doc beef meat byproducts trichlorfon

DOC ASSUMING 10% OF BEEF CONSUMED IN US IS IMPORTED

TOTALNZ=1

TOTALZ=9

0.1

Attachment 3: Residue Information.

Filename: C:\Trichlorfon\trichlorfon**acute**.R96

Chemical name: Trichlorfon

RfD(Chronic): .0002 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day

RfD(Acute): .01 mg/kg bw/day NOEL(Acute): 10 mg/kg bw/day

Date created/last modified: 06-24-1999/09:06:31/8

Program ver. 6.77

Comment: Trichlorfon acute analysis

RDF indices and file names for Monte Carlo Analysis

1 trichlorfonmeat.rdf

2 trichlorfonfat.rdf

3 trichlorfonmeatbyprod.rdf

Food Crop			RESIDUE	RDF	Adj.Factors	Comment
Code	Grp	Food Name	(ppm)	#	#1	#2
323	M	Beef-dried	0.200000	1	1.920	1.000
324	M	Beef-fat w/o bones	0.500000	2	1.000	1.000
325	M	Beef-kidney	0.100000	3	1.000	1.000
327	M	Beef-lean (fat/free) w/o bones	0.200000	1	1.000	1.000
326	M	Beef-liver	0.100000	3	1.000	1.000
321	M	Beef-meat byproducts	0.100000	3	1.000	1.000
322	M	Beef-other organ meats	0.100000	3	1.000	1.000
429	M	Veal-dried	0.200000	1	1.920	1.000
424	M	Veal-fat w/o bones	0.500000	2	1.000	1.000
426	M	Veal-kidney	0.100000	3	1.000	1.000
425	M	Veal-lean (fat free) w/o bones	0.200000	1	1.000	1.000
427	M	Veal-liver	0.100000	3	1.000	1.000
430	M	Veal-meat byproducts	0.100000	3	1.000	1.000
428	M	Veal-other organ meats	0.100000	3	1.000	1.000

Filename: C:\Trichlorfon\trichlorfon**chronic**.R96

Chemical name: Trichlorfon

RfD(Chronic): .0002 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day

RfD(Acute): .01 mg/kg bw/day NOEL(Acute): 10 mg/kg bw/day

Date created/last modified: 06-24-1999/09:07:28/8

Program ver. 6.77

Comment: Trichlorfon chronic analysis

RDF indices and file names for Monte Carlo Analysis

1 C:\Trichlorfon\trichmeat.rdf

Food Crop			RESIDUE	RDF	Adj.Factors	Comment
Code	Grp	Food Name	(ppm)	#	#1	#2
323	M	Beef-dried	0.200000	0	1.920	0.100
324	M	Beef-fat w/o bones	0.500000	0	1.000	0.100
325	M	Beef-kidney	0.100000	0	1.000	0.100
327	M	Beef-lean (fat/free) w/o bones	0.200000	0	1.000	0.100
326	M	Beef-liver	0.100000	0	1.000	0.100
321	M	Beef-meat byproducts	0.100000	0	1.000	0.100
322	M	Beef-other organ meats	0.100000	0	1.000	0.100
429	M	Veal-dried	0.200000	0	1.920	0.100
424	M	Veal-fat w/o bones	0.500000	0	1.000	0.100
426	M	Veal-kidney	0.100000	0	1.000	0.100
425	M	Veal-lean (fat free) w/o bones	0.200000	0	1.000	0.100
427	M	Veal-liver	0.100000	0	1.000	0.100
430	M	Veal-meat byproducts	0.100000	0	1.000	0.100
428	M	Veal-other organ meats	0.100000	0	1.000	0.100

Attachment 4: Acute Analysis, Reassessed Tolerances.

U.S. Environmental Protection Agency Ver. 6.78
 DEEM ACUTE analysis for TRICHLORFON (1989-92 data)
 Residue file: trichlorfonacute.R96 Adjustment factor #2 NOT used.
 Analysis Date: 06-24-1999/09:54:02 Residue file dated: 06-24-1999/09:06:31/8
 Acute Reference Dose (aRfD) = 0.010000 mg/kg body-wt/day
 NOEL (Acute) = 10.000000 mg/kg body-wt/day
 MC iterations = 1000 MC list in residue file MC seed = 10281
 Run Comment: Trichlorfon acute analysis using 0.1 ppm for meat byproducts, 0
 .2 ppm for meat, and 0.5 ppm for fat.

Summary calculations:

95th Percentile		99th Percentile		99.9th Percentile			
Exposure	% aRfD	MOE	Exposure	% aRfD	MOE	Exposure	% aRfD
U.S. pop - all seasons:							
0.000168	1.68	59699	0.000480	4.80	20812	0.001086	10.86
All infants (<1 year):							
0.000002	0.02	>1000000	0.000365	3.65	27409	0.001354	13.54
Nursing infants (<1 year):							
0.000000	0.00	>1000000	0.000375	3.75	26648	0.001228	12.28
Non-nursing infants (<1 yr):							
0.000005	0.05	>1000000	0.000364	3.64	27479	0.001452	14.52
Children (1-6 years):							
0.000340	3.40	29407	0.000891	8.91	11226	0.001761	17.61
Children (7-12 years):							
0.000239	2.39	41819	0.000606	6.06	16507	0.001249	12.49
Females (13+/preg/not nsg):							
0.000139	1.39	71876	0.000384	3.84	26013	0.000816	8.16
Females (13+/nursing):							
0.000124	1.24	80933	0.000311	3.11	32117	0.000737	7.37
Females (13-19 yrs/np/nn):							
0.000157	1.57	63545	0.000419	4.19	23886	0.001004	10.04
Females (20+ years/np/nn):							
0.000120	1.20	83142	0.000364	3.64	27467	0.000763	7.63
Females (13-50 years):							
0.000134	1.34	74524	0.000389	3.89	25739	0.000816	8.16
Males (13-19 years):							
0.000213	2.13	46970	0.000485	4.85	20617	0.000971	9.71
Males (20+ years):							
0.000163	1.63	61458	0.000421	4.21	23730	0.000840	8.40

Attachment 5: Chronic (Non-Cancer) Analysis, Reassessed Tolerances.

U.S. Environmental Protection Agency Ver. 6.76
DEEM Chronic analysis for TRICHLORFON (1989-92 data)
Residue file name: C:\Trichlorfon\trichlorfonchronic.R96

Adjustment factor #2 used.

Analysis Date 06-24-1999/09:09:38 Residue file dated: 06-24-1999/09:07:28/8

Reference dose (RfD, CHRONIC) = .0002 mg/kg bw/day

COMMENT 1: Trichlorfon chronic analysis using 0.1 ppm for meat byproducts, 0.2 ppm for meat, and 0.5 ppm for fat.

Total exposure by population subgroup

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.000025	12.3%
All infants (< 1 year)	0.000011	5.4%
Nursing infants	0.000009	4.7%
Non-nursing infants	0.000011	5.7%
Children 1-6 yrs	0.000049	24.3%
Children 7-12 yrs	0.000035	17.5%
Females 13-19(not preg or nursing)	0.000023	11.4%
Females 20+ (not preg or nursing)	0.000017	8.6%
Females 13-50 yrs	0.000019	9.5%
Females 13+ (preg/not nursing)	0.000019	9.6%
Females 13+ (nursing)	0.000016	7.8%
Males 13-19 yrs	0.000030	15.2%
Males 20+ yrs	0.000023	11.5%